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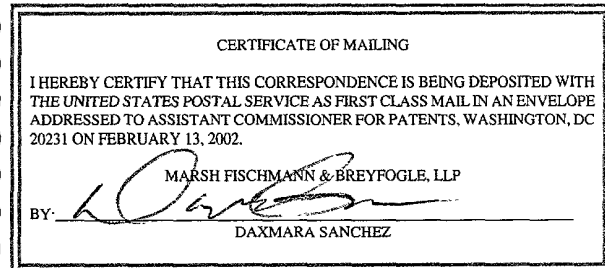|	
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For: "METHOD AND SYSTEM FOR
MANAGING LOCATION INFORMATION
FOR WIRELESS COMMUNICATIONS
DEVICE"

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

The applicant in the present application is a small entity and hereby claims Small Entity Status.

Respectfully submitted,

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METHOD AND SYSTEM FOR MANAGING LOCATION INFORMATION FOR

WIRELESS COMMUNICATIONS DEVICES

Related Applications

This application claims priority under 35 U.S.C. §119 to prior U.S. Provisional

5   Patent Application Serial Number 60/269,506 filed February 16, 2001, the entirety of

which is hereby incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to a system and method for managing distribution of

location information generated for wireless communications devices, and more

10   particularly to providing a control system configurable to limit access to a subscriber's

wireless device based on subscriber privacy preferences.

BACKGROUND OF THE INVENTION

In recent times the use of wireless communications devices has grown

15   dramatically. In many countries throughout the world sophisticated wireless

communications networks have been built so that wireless communications are possible

from almost any geographic location. Devices employable in these networks may

include wireless telephones and pagers, as well as specially configured palm top

computers and PDA's. Types of communication possible by these devices may include

20   the exchange of audio and textual information as well as the establishment of connections

over the Internet. As the use of wireless communications devices has grown, so have the

number of services related to the provision of wireless communications.

One such service which is available and is associated with the use of wireless communications devices, is the provision of location based services which focus on the issue of providing value-added services to subscribers based on the geographic location of a wireless device within a wireless network. In one form of the service, subscribers

5   may be able to access information about businesses which are in close geographical proximity to their wireless communications device. As the subscriber to the services moves about within different locations in the wireless network, additional queries may be made as to businesses located in their vicinity.

As a modification of the above-described location services, businesses or other

10   organizations may wish to track the location of a wireless device on a periodic basis and then use this information in any number of different ways. For example, a business selling services may provide different information as to the locations of their establishments based on where the subscriber is located. Further, businesses which deal in the fast efficient delivery of services may wish to track their employees through

15   monitoring the location of wireless communication devices.

SUMMARY OF THE INVENTION

The inventors have recognized that certain privacy issues may exist with regards to the provision of location information of wireless communications devices to requesting

20   client applications. Specifically, a wireless device user may wish to limit access to their location information according to any number of privacy preferences, such as the time of day of the request, their current location at the time the request is made, the accuracy of the provided information and/or the party who is seeking such information. As such, the

inventors have further recognized that providing an interface system between the party

seeking the location information and the system which collects and stores the location

information provides to the wireless communication device user the ability to control the

access which the third parties may have to their location information.

5   Described herein is a system and method for controlling access to location

information which has been generated by a system which monitors and stores location

information gathered for subscriber wireless communications devices. Included in the

system is a memory which is configurable to store records (profiles) for each wireless

communications device for which location information is being gathered. At a minimum,

10   each profile may include identification information for the device, a description of at least

one client application to which location information may be provided when requested,

and privacy preferences which controls the manner in which location information is

provided to the client application.

Also included in the system may be one or more interfaces through which

15   external parties may gain access. The interfaces are configured at a minimum to process

requests for location information from a client application. As part of the request

processing, the interface is configured to access the memory and retrieve a profile for the

wireless communications device for which the location information is requested. Based

on whether the requesting client application is listed in the profile, the location

20   information may then be provided in a manner defined by the privacy preferences

established for the particular client application. Privacy preferences includable in a

particular profile for a subscriber may comprise total denial of access, limited access

during a specified time period, limited access to a particular type of entity making the

request, access only granted to request of a particular granularity, and access only granted

when the wireless communications device is within a particular geographic region.

The interface may be further configured such that subscribers may access the

system described herein over a data network, such as the Internet, and access their own

5   subscriber profile. Through a variety of interactive displays, the subscriber may change

listing of authorized client application, privacy preferences, as well as access information

to the profile (i.e., passwords). The interfaces provided for this access may be in HTML

format for access with an Internet web browser or wireless application protocol (WAP)

when employing an Internet enabled wireless communications device.

10   The interface described above may be further configured to perform authorization

and authentication processes for client applications which periodically request location

information for one or more wireless communications devices. Profiles for authorized

client applications are created and stored in memory and may be accessible by a client

application in a manner similar to what was described above with regards to subscribers

15   accessing their own profiles. Included in the client application profile may be such items

as client identification and access information (e.g.. ID's and password) location request

processing for information such as the client application such as location request types,

time periods when the location request are limited, limits on frequency on the location

request, granularity for the location information provided, notification provisions for

20   alerting a wireless communications device when a request for location information is

made. When a client application accesses the system described herein identification

information is first provided and compared against the information in the client

application profile. If the information matches, additional function may then be performed.

Further included in the system described herein may be another interface specially configured for communicating with a location server device. The location server is

5   configured to perform the function of collecting location information generated for one or more wireless communication devices and providing this information to the system described herein. The system may be configured to keep a cache of location information for particular wireless communications devices over a predetermined period of time. The system described herein may also be configured such that it is resident on the same

10 computing platform as the location server.

The system described herein may be further configured such that other ancillary functions are performed with regards to the provisions of location information to requesting client applications. These functions may include automated billing for each instance where location information is provided. This may be performed through a data

15 network connection with a remote billing function. The system may be further configured such that requests for location information are processed on a priority basis, that is, client applications with the highest priority have their request filled first. This may be especially advantageous with regards to providing information to emergency services which may request location information for a particular wireless

20 communications device.

In operation, a client application will submit a request over a data network to the system requesting location information for an identified wireless communications device. Included in the request will be identification information for the particular wireless

communications device. This information may be in the form of Mobile Station ISDN

Number/Mobile Identification Number (MSISDN/MIN) , permanent identifier (PSID),

and time/session limited identifier (SSID). As was described above, each subscriber has

a profile stored in memory which includes corresponding identification information for

5   the wireless communications device, a listing of client applications authorized to receive

location information, as well as privacy preferences employable in providing location

information to the requesting client application. Once the profile is retrieved from

memory an analysis is performed as to whether the client application may receive

location information, and if so, in what form. After this analysis is complete, the location

10   information is retrieved, either from a remotely located location server or a data cache

and provided to the requesting client application.

When a request for location information is made by a client application, before

steps are performed in providing location information, the authentication and

authorization process for most requests is performed. As was mentioned above, client

15   applications which employ the system described herein each have a client application

profile which is stored in memory. When a client application accesses the system

described herein, the information in the client profile is compared against information

provided by the client application, and if the information matches, the location request is

processed according to controls and preferences included in both the client and subscriber

20   profiles.

In yet another step, both the client and subscribers may access the system

described herein, to view and modify their respective profiles. Upon detected access by

either type of party and then through appropriate selection made at the login screen,

interactive screen displays are presented through which the particular party may view

and/or amend their profile information. Once an indication is provided that the session is

completed, the changes entered are saved as part of the particular profile. The system

herein is configured such that the operation described herein may be performed over the

5   data network using a commercial web browser or through a WAP enable wireless

communications device connecting through a WAP gateway.

BRIEF DESCRIPTIONS OF THE DRAWINGS

Fig. 1 discloses a communications architecture within which the access system

10   described herein operates.

Fig. 2 discloses an operational architecture for the access server.

Fig. 3 discloses an example profile for a subscriber.

Fig. 4 discloses an example profile for a client application.

Fig. 5 discloses a flow chart which describes the steps performed in the

15   authentication process for client applications.

Fig. 6A and 6B disclose a flow chart which describes the steps performed in

performing access management of the location information for a wireless

communications device.

20   ## DETAILED DESCRIPTION

Disclosed in Figure 1 is an overall system architecture within which a wireless

communications device and the system described herein operate. Shown in particular is

wireless communications device 14 which communicates via wireless tower 12 over the

wireless network 10. The wireless communications device 14 may comprise any number

of known wireless communications devices such as a wireless telephone including 3G

phones with direct HTML interfaces, a pager, and/or a PDA which was either designed

for wireless communications or later configured to perform these functions. The wireless

5   communications devices may be further configured for short message service (SMS).

The wireless communications network 10 is in communication with the SS7 network 30

which in turn is part of the public switch telephone network (PSTN).

       As is known, wireless communications devices may be configured to include

web-browsers which allow for navigating over the Internet. In order to provide for this

10   type of communication, the wireless communications device is configured to employ

protocols such as the wireless application protocol (WAP). The wireless network 10 may

provide a connection to the Internet 20 through a WAP gateway 16 in order to provide for

these types of communications.

       Continuing on with Fig. 1, in connection with the Internet 20 and the SS7 network

15   30, is location server 50. The location server 50 is a platform for collecting location data

and location primitives for designated wireless communications devices and then

providing this information to requesting applications. In one configuration of the

invention, the location server periodically receives location requests and in turn requests

the location information from one or more types of location finding equipment (LFE) as

20   to the current location of a wireless communications device and then stores the location

information in memory. In another configuration of the invention, the location server

actively initiates contact with one or more types of LFE to obtain the location of a

subscriber's wireless device. An LFE may employ different location finding

technologies, e.g., GPS, AOA, TDOA, and Cell sector technologies. The stored location

information may preferably include at least location information and corresponding time

information for particular wireless communications devices, and may further include

location uncertainty information, travel speed information, and travel direction

5   information.

In response to a location request from an external application, the location server

may retrieve location information from memory or, alternatively, one or more of the

LFE's may be prompted to obtain location information. In this regard, the location

request may include a specification regarding the desired location information, for

10   example, how recent or how accurate the information should be. If the memory includes

information conforming to the specification, then this information is retrieved and output

to a requesting application. Otherwise, appropriate information may be obtained by

prompting one or more LFE's to locate the wireless communications device of interest.

According to the system described herein, requests for location information

15   request are typically made through access server 40, but requests from trusted

applications may be made through the SS7 network 30 directly to location server 50.

Mapping data used in conjunction with providing visual presentation of location is

received from a geographic information system (GIS) 60. A more detailed discussion of

the operation of the access server 40 is provided below.

20   The access server 40 may comprise a number of components networked across

the data network, a separate server, and/or a system configured on the same platform as

the location server 50. In one configuration, the access server may be configured on one

or more Application Servers such as BEA System's WebLogic product., although one

skilled in the art would realize that any number of commercially available computing

platforms may be employed. The access server is configured such that it may establish

communications through any numbers of interfaces. According to the system described

herein, most requests for location information for wireless communications devices are

5   received at the access server either over the telephony network or over the Internet. In

response to the requests, the access server is configured to perform a number of different

functions. These functions include authentication of client applications requesting

location information, privacy screening for subscribers when supplying location

information to authenticated client applications, providing access for subscribers and

10   client applications so that they may control their own profiles, and various other

interfaces for administrative functions such as billing for location services.

Disclosed in Fig. 2 is a system architecture 200 for the access server which

includes the various processing sub-modules employed. Also shown are the external

entities which regularly communicate with the access server. Establishing a connection

15   with these entities may be performed in any number of ways. Connections may be

established either over the public switch telephone network (PSTN) or over the Internet.

In the case where a wireless communications device is employed to establish a

connection, a WAP gateway from the PSTN to the Internet may be employed.

The access server in one configuration of the invention may be partitioned in to

20   three separate areas. A first portion of the access server includes a front end web server

210 which may comprise servlet space. The front end web server 210 includes a number

of processing modules which act as interfaces for the various entities (i.e., client

applications, subscribers, customer care representatives, administrators, etc.) who access

the server. The back end call processing 230 is configured to include programming

objects, rules, and listings in memory which are employable by the various interface

functions resident in the front end web service 210. The back end call processing may be

configured in Enterprise Java Bean (EJB) space. The database space is configured to

5   store instances employed in conjunction with the operation of the access server and the

GIS. The database space 250 may be resident in one location or it may be distributed

across one or more networks. Portions of the database space 250 may also be associated

with other systems to which the system 200 may have access.

Included in the servlet space 210 is provisioning module 212 which is accessible

10   by administrative function 100 and is configurable to perform various low level functions

with regards to configuring the system for operation. Further included in the access

server is a customer care module 214 through which customer care representatives 102

may access the system. Functions to be performed through this interface may include the

creation modification, or deletion of subscriber and client application profiles. The

15   configuration of both the client and subscriber profiles will be described in greater detail

below.

The subscriber profile management module 216 is an interface which allows

subscribers to access their profiles which have been established for the provision of

location services. As will be described in greater detailed below, a profile includes

20   descriptive information for each subscriber as well as a number of different privacy

preferences establishable by the subscriber in order to control the provision of a

subscriber's location information to requesting client applications. Subscribers profiles

are accessible by a subscriber through any number means which include: over the

Internet through use of a local web browser, or the use of an enabled wireless

communication device employing a network interface protocol such as WAP. As part of

the subscriber profile management 216, various interactive screen displays may be

presented (in formats such as HTML for Internet access and WAP for wireless device

5   access) through which a subscriber may perform various functions with regards to

managing their profile.

Further included in the front end web server 210 is location proxy servlet 218.

As was mentioned above, Internet enabled wireless communications devices may connect

to the Internet through WAP gateway 108. In one configuration of the invention, a

10   number of location sensitive URL's may be stored in the WAP gateway 108 which will

cause a redirection of the WAP session to the location proxy servlet 218. After suitable

authorization, (of either the subscriber or client application) the inquiry received from the

gateway will be further processed to obtain a location of the subscriber.

The location may be returned to the original origin server as a name/value pair.

15   The location proxy 218 may support three methods of subscriber identification: 1)

anonymous-no identifiers provided (WAP sessions state must be maintain independent of

proxy) 2) ESID-an external identifier obtained from the WAP gateway (or WAP session)

is past along with location and is used to maintain session state/context, and 3) SSID-a

session identifier is created and delivered with location to the origin server. The location

20   proxy does not assign new identifiers to subscribers ID's. It accepts the MSISDN,

optional application ID, transaction ID and date range to filter the location against.

A function of the WAP location proxy is to service anonymous location

distribution to clients for which there is no direct association (permission) between the

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subscriber and client (typically a content service). In this case, no identifier is included

with the response and the client application makes no additional request directly to the

access server though a location transaction interface. The client profile will determine

what type of identifier is required. The client profile may have a component which is

5   specific to the WAP location proxy. A session ID may be used to allow the origin server

to make subsequent requests directly through the interface, or to preauthorize location

requests from a specific client for the duration of the session.

It is possible that a request received from the WAP gateway may not contain the

necessary parameters defined as mandatory for the location transaction interface. In that

10   case, a single set of defaults will apply and will be compared against parameters in the

client profile for all WAP location requests. These defaults will be stored in template-

driven default profile for location proxy client, and would be configured through the

administration functions.

In conjunction with providing access for subscribers to manage their profiles, the

15   same functionality is provided for client applications through client profile management

module 218. Access to this module may be gained over the Internet. Once access is

attained, various interactive screen displays may be presented wherein a client application

may access and modify their own profile. Access to the profile may be controlled

through an authorization and authentication process.

20   An external wireless location interface (EWLI) 222 is also accessible by client

applications 110 over either the Internet or the SS7 network. The EWLI 222 may be

described as XML/HTTP based interface with DTDs adapted to a proprietary or industry

standard format. This module is configured to provide a transaction interface which

enables processing of location requests from external client applications. Before

processing the location request, the EWLI 222 performs an authorization and

authentication test to determine if the requesting client application is authorized to

request such location information. Various procedures performed during the

5   authentication authorization include checking identification information and passwords

provided against the information in the client profile, making a determination that the

request rate has not been exceeded, and that the client application is still classified as

active.

In providing location information for a particular wireless communications device

10   the EWLI 222 works in conjunction with, the privacy module 224 which is configured to

access the subscriber profile stored in memory and perform an analysis of whether and to

what degree, location information may be provided to the requesting client application.

If the necessary criteria are met, the privacy module signals to the EWLI 222 that the

location information may be provided and the EWLI then acts to retrieve this information

15   either from a local cache or from the location server.

The location server interface 226 is configured to provide for communications

with location server 50. In many situations, trusted client application may directly

establish a connection with the location server over the SS7 network or other protocol. In

such cases privacy functions may still need to be performed and the location service

20   interface 226 is configured to provide a connection from the location server to the privacy

module 224. Once the privacy preferences are identified, the location server may then

provide the location information in the desired manner.

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Interconnected with the front end web server 210 is the back end call processing

230 which may be resident on the same server or otherwise distributed across a network.

Included in this portion of the server are a number of objects which are employable by

one or more of the interfaces in the front end web server. The back end call processing

5   230 is further in communication with the database space 250 which may be implemented

using compatible database software such as Oracle. Stored in the database space 250

which are instances 252 employable by the access server 252 and maps instances 254

employed by GIS 60. Stored in particular in the instances 252 are the profile information

for the subscribers and client applications.

10   Returning to the back end call processing 230, included therein is the permission

sub-module 232 which includes the permission objects employable by the EWLI 222

when interpreting the permission preferences for the subscribers. The data record

processing module 234 acts as a data cache which is employable to store a running record

of location information points for a particular subscribers over a particular period of time.

15   In order to avoid making a request of the location server every time a request is received

by a client application, this information may be continually provided by the location

server and the data record processing module acts to store a number of location points for

each subscriber. Some information requested by client applications may be provided

from this data module, however, in certain situations request may be made directly of the

20   location server.

The group object 236 provides a grouping of the client applications according to

similar privacy preferences designated by subscribers. Many times the same privacy

preferences may apply to a group of client applications (for example, all Microsoft client

applications may have similar privacy preferences) such that it simplifies the processing

of location request to group these client applications together. The user object 238

includes a listing of subscribers employing the access service described herein. Profiles

for each of the users may be retrieved from the instances 252 in the database space.

5   The mobile station object 240 is a listing of identification codes for each

subscribers wireless communications device. The identification codes are resolved in

MSISDN and/or MIN.

The security object 242, in conjunction with the permissions object 232, performs

the analysis with regards to whether a permission applies to a received location request.

10   When the privacy preferences of a subscriber profile are being analyzed, the security

object 242 will access the permission relationships the permission object 232 in order to

perform this analysis. Finally the sub ID manager 244 tracks the sub ID's that are

assigned to wireless communications devices when location information is provided. In

one or more countries, it may be illegal to provide both the telephone number and

15   location information for a particular wireless communications device. As such, sub ID's

are assigned to these devices and this number is use to identify the device when a request

for location information is made. The sub ID manager 244 merely tracks the relationship

between the actual phone number and the assigned sub ID.

Also in connection with the location server 50 and the access server 40 is the GIS

20   60. This system is configured to employ the location information and stored map

information in order to provide a visual display of a wireless communications device

location. Some client application or subscribers may have the option of viewing the

location information in this format.

As was mentioned above, stored in memory are profiles for both the client

applications and subscribers. Disclosed in Fig. 3 is an example of a profile for a

subscriber which, as mentioned above, identifies the subscriber's wireless

communications devices and includes a listing of privacy preferences for client

5   applications which have been authorized to receive location information. In particular,

the profile includes a customer Id 302 which is a unique customer identifier for

subscribers with one or more MIN/MSISDNSs. The operator Id 304 is a numeric

identifier (typically 10 digits) used to identify the operator (both service provider and

network operator) for which the subscriber is associated with.

10   The user name 306 is a name established by the subscriber and is used when

logging into the system. The user may also employ an alias 308 which is used for

subscriber personalization during web, WAP, or SMS interaction. A subscriber profile

password 310 may be set by the subscriber, in order to limit access to the profile.

Other items which may be included in the modifiable subscriber profile are the

15   status 312 which indicates whether the subscriber is active or inactive. The language

preference 314 indicates the language of choice of the subscriber and may be indicated by

a three character code. The MIN/MSISDN 316 is an identification number for the

wireless communications device or SIM card in such device. The PSID 318, a permanent

identifier, is not easily derivable from MIN/MSISDN 316, that may be used to identify

20   subscriber by specified clients during position requests. The global privacy flag 320

when set to "off" blocks all location request, except for privacy override. If "on" is

indicated in this box, the permissions described below will define the privacy.

One option provided by the system described herein is for a subscriber to receive a notification on their wireless communications device whenever a location request is made by any client application. In the provision notification option 322, the subscriber may enter a particular selection for notification. The options may include: employ the application profile option for the requesting client applications, no notification, notify every time but no response required, notify every time, response required (for example through an SMS flash or web notification).

The final entry in the subscriber profile 300 is the permission sets 324 for client applications which will make requests. An entry is included in this part of the profile for each authorized client. Permission sets for each authorized client may include a temporal permission set which identifies the time of day/day of week a particular authorized client may access the location information. The spatial permission set provides a listing of the enabled geographic areas (for example city/county/state), for providing the location information. The granularity filter indicates for a particular client application the allowed accuracy of the location information which is to be delivered. The allowed accuracy may be employable for selecting a particular location technology (i.e., AGPS vs. cell/sector). The subscriber may also indicate in this permission set the type of notification to be received when a location request is made.

Disclosed in Fig. 4 is a client application profile 400 which includes information employed during the authorization and authentication process for client application which a client application may access and modify. The client ID 402 is a unique identifier for a business provider of one or more applications and the application ID 404 is a unique number identifier for each of the client's applications authorized to receive location

information. Each client who employs the system described herein may employ multiple

applications each of which may request location information. The client ID and the

application ID may be employed in conjunction with the application password 406 when

a client application logs into the system. The application name 408 may be a character

5   chain used in notification messages and service provisioning selection. The application

type 410 may be an integer value employed by the operator to classify applications into

sub-groups. Further, an application description 412 may be a character description of the

application used for subscription pages to describe the application for subscribers.

The status 414 may indicate whether the particular application is active or

10 inactive. Only active applications may be allowed to make request of the access server.

The user identification 416 portion the client application profiles indicates in what

manner a subscriber will be identified when the client application makes a location

request. Options include: MIN/MSISDN, PSID and SSID.

The request rate threshold 418 provides a limitation of the maximum number of

15 requests per unit time (request throttling) that the particular client application may make.

The allowed request type 420 provides an indication of the types of request allowed for

this particular client. A Boolean flag may indicate whether the request is allowed or

disallowed. The allowed accuracy 422 provides an indication in horizontal and/or

vertical measurements of the accuracy of the provided location information.

20 The highest allowed priority 424 indicates the highest priority level allowed for

this particular client and a default which is used for requests. The privacy override

permitted 426 either allows a privacy override (typically set for emergency client

applications) or does not allow it. The coordinate preference 428 merely indicates the

form in which the particular client application which is to receive the location

information. For example, choices may include WGS84, Gauss/Kruger, lambert, UK

ordinance, Dutch RD, and Swiss Grid.

The cache option 430 provides an indication of the maximum age of the location

5   information stored in cache which may be provided to the client application. The

location notification options 432 may be selected to identify the type of notification a

subscriber may receive when a client application makes a location request. The options

may include using the subscribers profile settings, no notification, notify subscriber, no

response required, and notify subscriber, response required. Finally the provision

10   notification option 434 provides an indication of the type of notification which will be

generated when the client application signs up to receive location information for a

particular subscriber. The options may include no notification, notify subscriber, no

response required, and notify subscriber, response required.

As was described above, the profiles 300 and 400 are accessible by the subscriber

15   and client applications, respectively, over the telephony network or Internet. When an

Internet ready wireless communication device is employed, a WAP gateway may be

accessed to facilitate the connection. The profiles may be presentable on an interactive

HTML (or WAP) based screen display through which the accessing party may modify

certain, parameters. Allowed values for each parameter may be selectable from

20   drop/down boxes wherever possible to minimize manual entry errors and default

parameters will be assigned to all fields not populated. In addition to the subscriber and

client application profile described above, a set of administrative functions may also be

included in the access server to configure and maintain various operational parameters

within the system which includes: client/subscriber profile template default, subscriber

identifiers, the ability to add/modify/delete client applications from the system, and client

type definitions.

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In typical operation for the system, client applications will periodically make

request to access and retrieve the current location of a particular wireless communications

device. Requests are typically received through the EWLI location interface. According

to the invention described herein, the client application may comprise any number of

services provided by registered organizations. One service in particular may include

emergency services which may be trying to respond to an emergency call received from

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the wireless communications device. If the location information may be easily located

and retrieved, emergency services may be more quickly dispatched. In this situation,

high priorities may be given to emergency services which circumvent the entire privacy

profile and immediately provides the information.

Other client applications may be service or goods providers whose business is

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geographically oriented. For example, if a wireless communications device is in the area

of a particular hotel, restaurant, and/or store, the business may want to know that, so

relevant advertising may be transmitted to the wireless communications device. In

another example, the client application may be a business which wishes to periodically

track the locations of their employees.

20

As was described above, one of the first steps performed when a client application

is making a location information request, is the authentication and authorization of that

particular client application. Disclosed in Fig. 5 is a flow chart which describes in detail

the steps performed when authenticating and authorizing a client application. Initially,

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the client application will access the system either through the EWLI location interface

222 or directly though the location server via the SS7 network, wherein the LS interface

226 will receive the communication. Once the location request is received from the

client application, the authentication and authorization process will begin. As an initial

5   step, a query may be made as to whether the client identification number and password

have been received. When received, the system will search for the corresponding client

application profile in memory.

Once the client application profile is retrieved from memory, a comparison is

made between identification information included in the profile and that provided by the

10   client application. If the information does not match, a "denied access" message will be

presented to the requesting application. If the proper identification and password

information is provided, before any of the subscriber information is identified and

retrieved, a query will be made as to whether the particular client has exceeded a request

rate threshold. This procedure may be performed by accessing the data log in memory to

15   identify previous requests. If the request rate threshold has been exceeded, the system

will deny the request and log the activity.

If the request rate threshold has not been exceeded, a further analysis is made as

to whether the type of request being made by the client application is allowed according

to the client application's own profile. If the request type is disallowed, the request is

20   denied and the activity is logged in memory. If the client is authorized to make a request,

this also noted in memory and the process is begun to retrieve and provide access to

location information for the identified wireless communications device.

Disclosed in Figs. 6A and 6B is a flow chart which describes in detail the steps

performed in order to control access to the location information for an identified wireless

communications device according to a subscriber's privacy profile. As a first step, using

the identification information for the device provided by the requesting party (client

5   application), a search is performed of the database to identify and retrieve the appropriate

subscriber profile. The identification information for the subscriber may be received by

the system in at least two ways. The first way is as a result of the authentication

authorization process described in detail in Fig. 5. The other way is through the location

server 50 which may be contacted directly by trusted applications (for example

10   emergency services). In this situation, the location server is configured to establish

contact with the privacy module 224 which in turn retrieves the subscriber's profile and

provides location information according to the profile.

The first query made once the subscriber profile is retrieved, is to whether the

global privacy flag is set to "off". A subscriber has the option of completely turning off

15   the privacy profile such that any queries for their location information are denied. The

only situation where the location information will be retrieved in this situation is if the

client application has a privacy override. If a client does not have the privacy override

and the global privacy setting is set to "off", the request will be denied.

If the global privacy flag is not set to "off", the subscriber permission set is then

20   accessed within the profile. In most situations, the subscriber has indicated which client

applications may receive location information. Each client application listed may further

include one or more limitations as to the manner in which the location information will

be provided. If the particular client application is not included in the privacy profile, the

request for location information is denied. The subscriber may have the option of configuring their privacy profile such that any and all parties who request the information may be provided the data. However, in most cases it is assumed that the subscriber has specifically indicated that the client application is to receive location information.

5   If the client application does have access to the location information, the location information is retrieved from a data cache or from the location server. At this point, an analysis is made as to whether, based on the preferences included in the profile, the particular client application may receive the location information. As was mentioned above, each profile includes a permission set for each client application which further

10   specifies a temporal permission set (time of day/day of week), a spatial permission set (enable geographic area-city/country), a granularity filter (allowed accuracy to deliver) as well as a location notification option for notifying the subscriber when a location request is made. Before the location information is provided, a determination is made as to whether, for that client application, there are spatial or temporal limitations. The

15   current spatial and temporal characteristics for the location of the identified wireless communications device are then analyzed and compared against the retrieved permission set. Based on this comparison, a determination is then made as to whether the location information may be provided to the requesting party based on the established permission set.

20   For example, if the permission set for a particular client application is established such that location information will only be provided when the particular wireless communications device is in Colorado, and the access server detects that the wireless communication device is in New York City, the request for information will be denied.

Either in conjunction with or separately, if temporal limitations are put on the provision of the location information, and if the request for location information is made outside of a specified time period, the request for location information will also be denied. The system described herein is configured to account for the movement of the

5   communications device within different time zones.

Once it is determined that the client application may receive the location information, the granularity permission is analyzed to determined the form in which the information should be provided. If there is no limitation provided then the most specific form of information is provided, otherwise based on the permission set, the information is

10   converted to the noted granularity. A last query is then made to determine whether the subscriber has selected any notification options for being notified when a client application is making a location information request. If there is a notification option chosen, this notification is provided in conjunction with the transmission of the location information to the client application. Also in conjunction with the transmission of the

15   location information, a data log may be updated and various other administrative tasks performed, such as billing, which relates to the provision of the location information to the client application.

The foregoing description of the present invention has been presented for purposes of illustration and description. Furthermore, the description is not intended to

20   limit the invention to the form disclosed herein. Consequently, variations and modifications commensurate with the above teachings, and the skill or knowledge of the relevant art, are within the scope of the present invention. The embodiments described hereinabove are further intended to explain best modes known for practicing the

invention and to enable others skilled in the art to utilize the invention in such, or other,

embodiments and with various modifications required by the particular applications or

uses of the present invention. It is intended that the appended claims be construed to

include alternative embodiments to the extent permitted by the prior art.

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